Linux

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Getting Started

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At the end of this Session, you will be able to:

- Explain what operating system, program and process are.
- Explain the terms multi-tasking and multi-user.
- Define the term user and group
- Explain the purpose of a password
- Define what the super user is

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Operating System

- an operating system (OS) is the software which the hardware of a computer needs to be operational
- it manages all the internal and external hardware, like hard disks, processor power, input/output (I/O) devices, memory, etc
- it provides a system to manage & organize the data (files), the file system
- it should also provide a security system to control data access
- 3 types of OS's: Single, Multiuser and Multitasking systems
- some OS examples: MS-DOS, MS-Windows, PDOS, Linux and Unix

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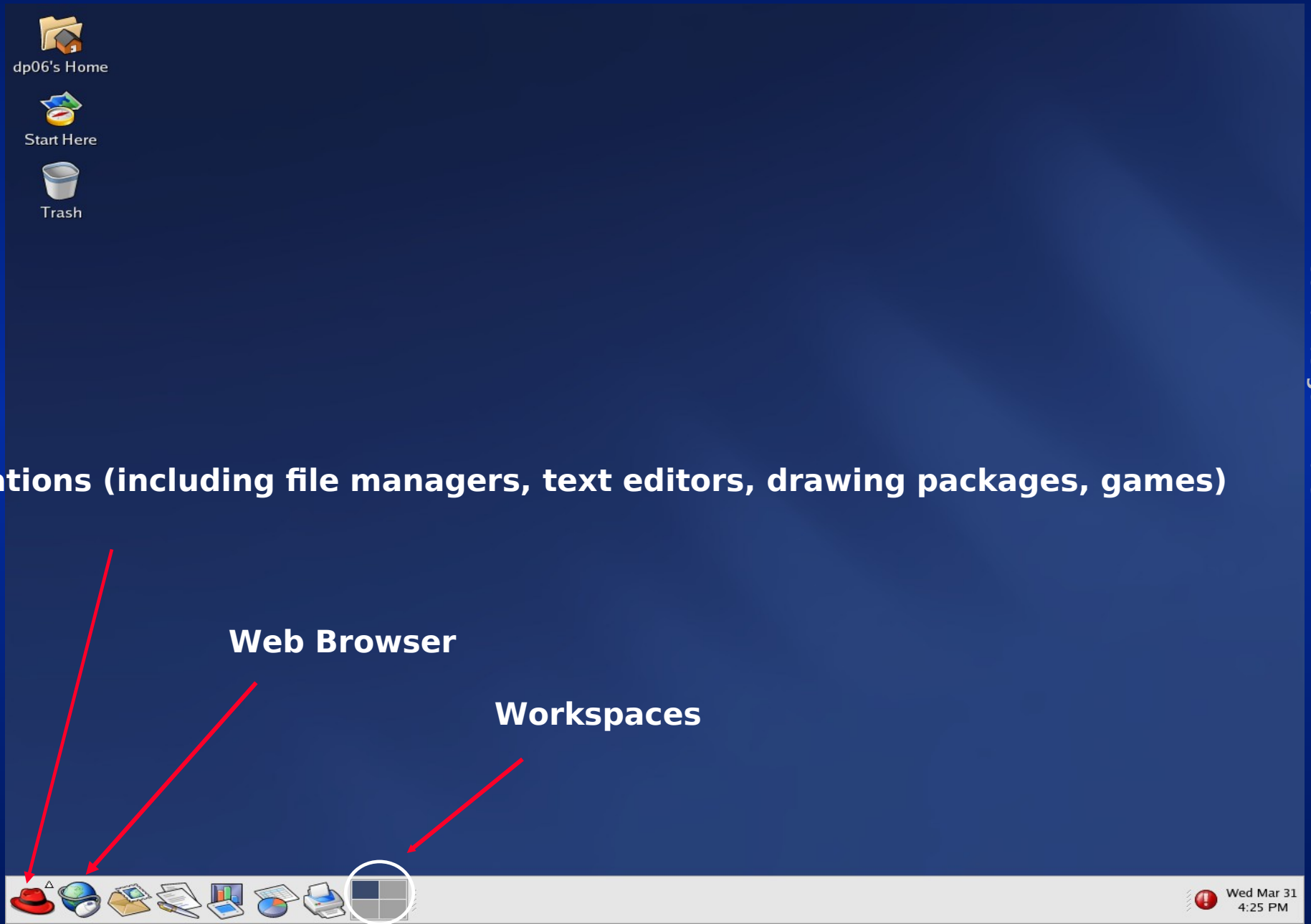
Linux Redhat



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Programs & Processes

- What is a Program?
  - a program is a sequence of processor commands loaded into the RAM
  - the BIOS and the OS are also programs
- What is a Process?
  - in Linux any program in execution is a process, this could be an application, a started shell, a command typed in a shell, a print service, etc
  - a process consist of a *program* (in RAM) and its *environment*
  - the operating system manage the process and provides the environment for it, like user-id,

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Multi-Tasking

- Linux is a multi-tasking system, which means it can run several processes simultaneously
- however, only one process at the time can be in a CPU, so if there is more than 1 process they have to share the CPU time
- therefore the entire CPU time is divided into small units called “time slices”
- a process stays for one slices in the CPU, then the system looks if there is another process in the memory requiring CPU power
- the access to the CPU is controlled by priorities
- for each slice a process stays in the CPU its priority sinks
- priorities for processes outside the CPU will be

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Users

- anybody who works on a Linux machine is a “user”
- to be able to work with Linux the user has to “login”
- to be able to login you have to be an approved user (the system must know the user)
- each user has a “user name” which is used to login
- a user should always use a password
- different users can login in at the same time (multi-user system)
- the system can apply for each user different access rights

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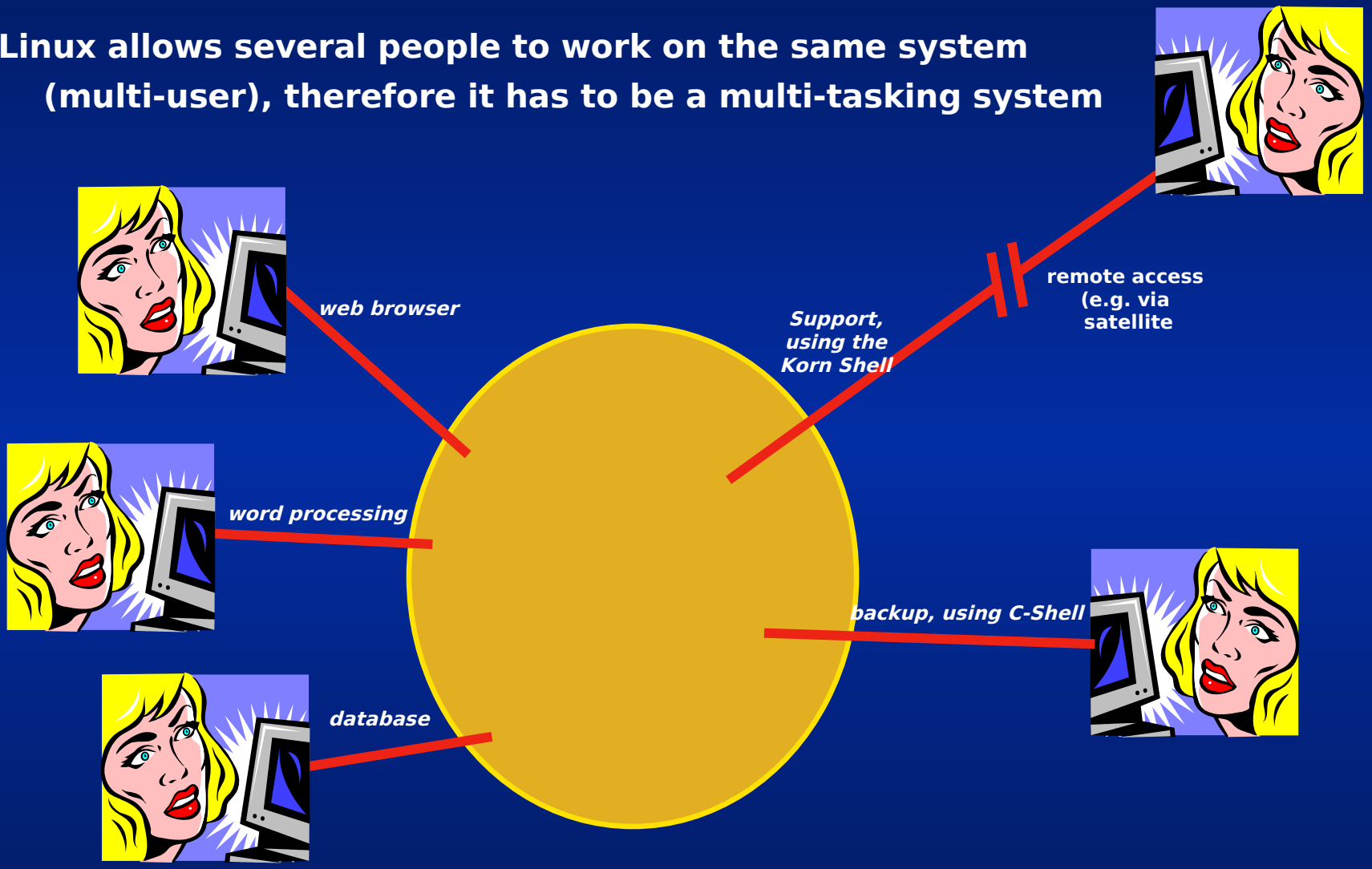
Multi-Tasking & Multi-User

Linux allows several people to work on the same system (multi-user), therefore it has to be a multi-tasking system



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Passwords

- A user on a Linux system should always have a password
- Security of passwords is very important!
- Our machines are part of a global network of computers, so we like to protect them from unauthorize access
- In general obvious passwords should be avoided

You are under no circumstances allowed t
the password on any of the training syste

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Super User

- each Linux system has a “super user”
- the super user name is “root”
- the super user has administrator rights for the system

Since you have full access to the system as super user you

have to be very carefully with what you do!
There is no “Undo”!

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Groups

- a group is a collection of u
- for each group access rights can be set
- Groups are set up/defined by the super user

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System Basics

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At the end of this Session, you will be able to:

- Find out what processes are currently running on the system.
- Log in and out from a machine.
- Open a terminal or xterm window.
- Explain the syntax of linux commands
- Use the Linux online manual – the ‘man’ command.

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Redhat Window Manager

- **Login**

  User name and password are entered from the Redhat login screen

  Login : **train??**

  Password :

- **Logout**

  Click on the Redhat and choose logout

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Redhat Windows Managers

- To open an xterm or terminal window:
  - Select the Redhat icon
  - Select *Terminal icon*.
- To close an xterm or terminal :
  - Click on the square in the top left of the window
  - Select *Close*
  - Alternatively you can also type “exit” in the window

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Processes

- Linux assigns also to each process a unique “PID (Process Identification)” number

- To identify what processes are currently running on a machine you can use the command

  % ps –u

- To identify how much CPU and memory a process is using

  % top

  Enter q (for quit) to stop the top

- To remove a process currently running on a machine you can use the command

  % kill –9 PID

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Command Syntax

- Linux commands (cmd) in a command line interpreter are entered as text strings
- Linux considers uppercase and lowercase to be different
- this applies to both: the spelling of a command as of any file, directory or device name
- commands are normally lowercase while options can be both upper- and lowercase
- Examples:

  “ls” is a recognised command, “Ls” or “LS” not

  “myfile”, “MyFile” and “MYFILE” are all different filenames

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Command Syntax

- many Linux commands are abbreviations, example the command to list files is an abbreviation of the word “list” -> ls
- so, to list files you type at the prompt:

```
%> ls
```

- most Linux command provide “options” or “switches”, to run the command with different features
- options are added behind the command, normally separated from the command with at least a space and mostly also followed by a dash (-), like this option which generates a long file listing:

```
%> ls -l
```

- several options can be combined, like “-la”, generating a long listing of all files

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Useful shortcuts

- **linux has many useful and time saving features**

  Scroll through your previous commands

  Edit previous commands

  Ctrl (^)p, ^n Scroll through similar commands

  Eg. **ls <Ctrl>p** gives previous uses of ls

  Ctrl (^)a move cursor to start of line

  ^e move cursor to end of line

  ^u delete current line

  ^t transposes last two characters typed

^u = Key: Ctrl + u

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Changing User

- **For system administration you need to be a “super user”**
- **If you haven´t logged in as “root” (super user) you can become a super user by using the command “su”**
- **Type at the prompt:**

%> su

Password: enter the super users password

“su” is a command to start a new shell with a new user. Only if you do not specify a user name behind the “su” command it assumes that you want to log in as super user. To become another user than super user type “su user name”. To return to your previous shell and user type “exit”

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Stopping a Linux Machine

- Never power down a Linux machine without halting it before
- Exit all applications and log out of the machine
- At the login screen choose Shut Down

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Man Command

- **Finding and executing Linux commands**
  - ***"man"*** **is an online manual and can be used to find the correct use of any Linux command. Try it to find more out about the "*** ***whoami*** **" command. Type in a (x)terminal window:**

    %> ***man whoami*** **<cr>**

  - **then use the command :**

    %> ***whoami <cr>***

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Man Command

- **Use of *man***

<cr> to move one line down

Spacebar to move one page down

b to move one page back

q To quit ***man*** before the end of the information

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Filesystem

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At the end of this Session, you will be able to:

- Explain the difference between a file and a directory in Linux.
- Define what the home directory is.
- Explain how to move between directories.
- Explain how to find out what directory you're currently located in.
- Explain the difference between absolute and relative paths.
- Explain how to create a new directory.
- Explain how to delete a directory.

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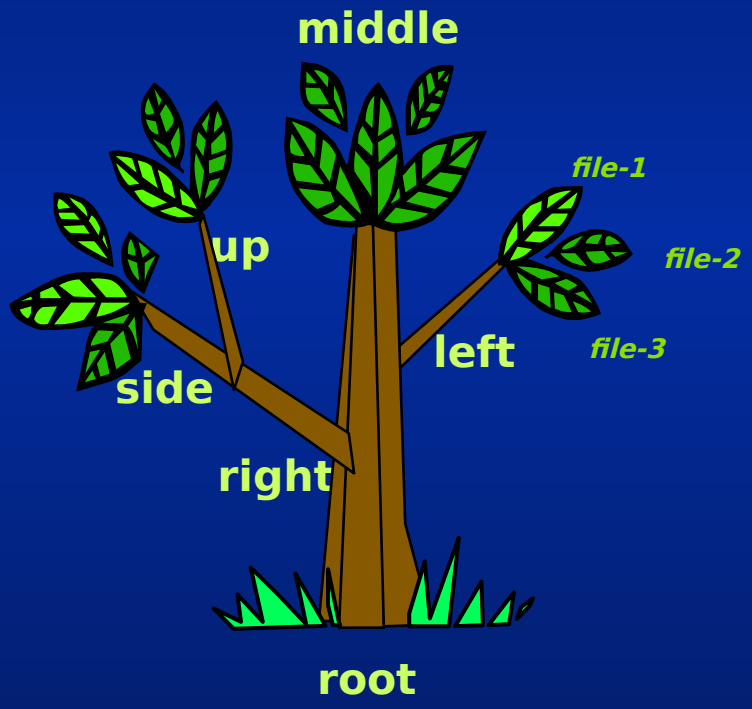
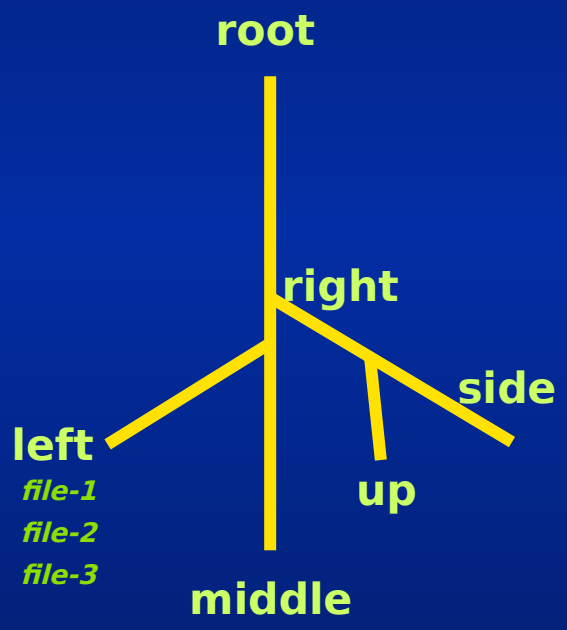
File Systems

The Linux Directory Tree





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File Systems

- the way a Linux file systems organises the data can be compared with a tree, where the tree branches are the "*directories*" and the leaves are the "*files*"
- as a branch can have other branches, a directory can 'contain' other directories, these directories are called "**subdirectories**"
- all files have a 'path' to the "*root*" directory, represented by a slash "*/*"

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File System

- the term “file system” is used to describe

  a) the Linux systems entire file structure (the tree) - from the root directory downward to the last directory

  b) a way of structuring and/or accessing data resources

- a data resources can be any location were data can be stored, this could be a local or remote disk drive, a changeable media (floppies, CD-ROMs) or even the machines memory (RAM)

- each type of data resource has his own type of file system

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Home & Root Directory

- Each user is assigned a home directory
  - when a user (eg. dp01) logs into a machine, the user will be in the home directory
- The home directory is where a user can store all their personal files
- The easiest way 'back home' is to type: *cd*
- The root users home directory is the beginning of the file system, represented by the slash "/", to get there type: *cd /*
- Now type the command ls to see what files are stored here
- Then go back to your home directory again

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Present Working Directory

- whenever you are in the file system you are in a directory
- the directory you are currently in is the “present working directory” or just “working directory”
- it is important that you always know in which directory you are
- with the “pwd” command you can find out your present working directory
- a process ‘knows’ also its working directory

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Absolute & Relative References

- There are 2 ways of describing a path to a file location

An ***absolute*** path always starts from the root directory, hence the first character in the path description is a ”/”.

The ***relative*** path starts always from your present work directory.

You should be familiar with both ways since most of the time one way is shorter than the other one. Knowing the ”short” way makes you work more efficient!

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Absolute & Relative References

ample of a way description "Home to Gym"

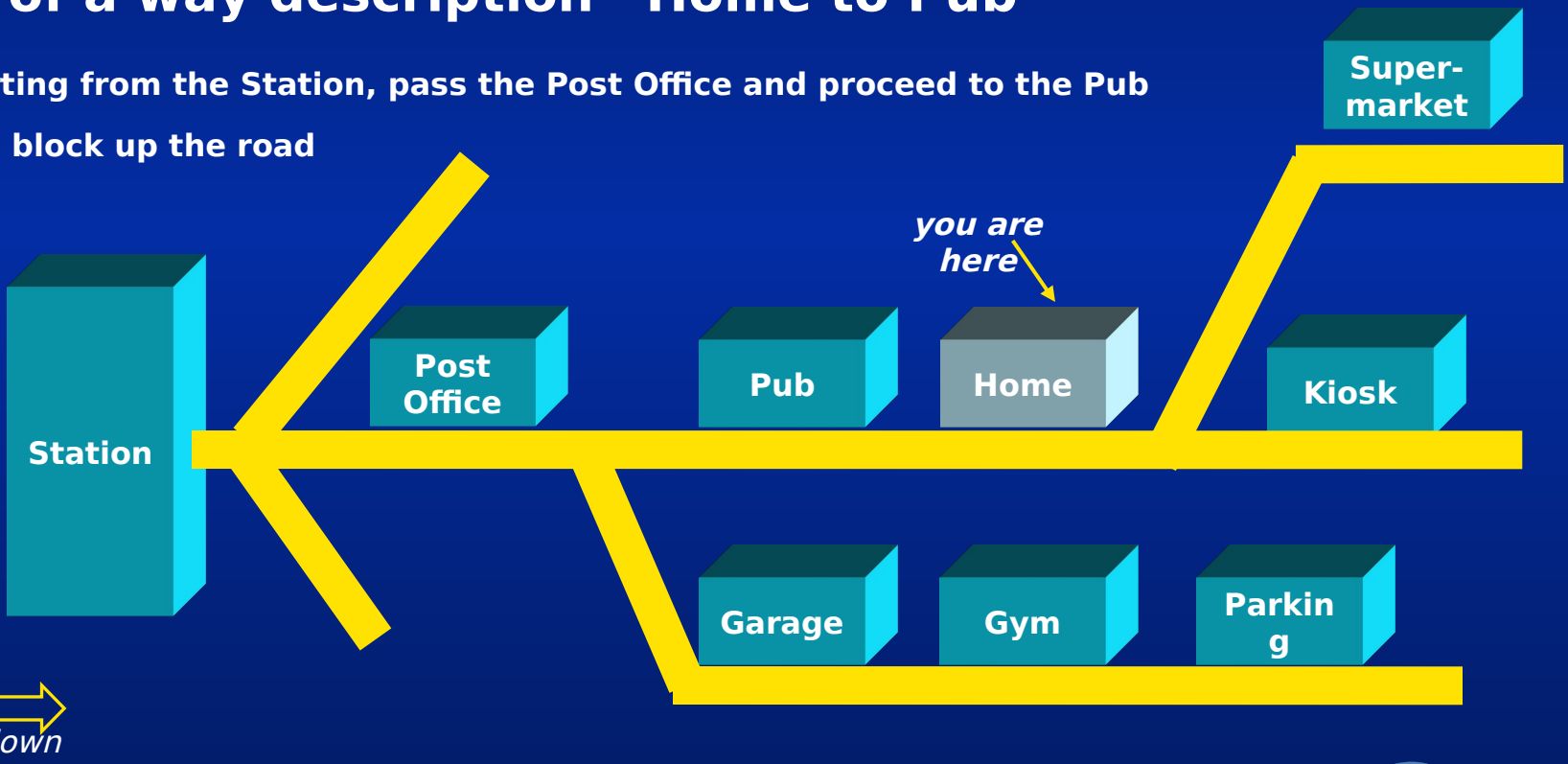
OLUT: Starting from the Station, pass the Post Office, at the crossing turn right to the garage and proceed

ATIVE: Up the road, passing this and the next block, turn left, pass the Garage and then proceed to the Gy

ample of a way description "Home to Pub"

OLUT: Starting from the Station, pass the Post Office and proceed to the Pub

ATIVE: One block up the road



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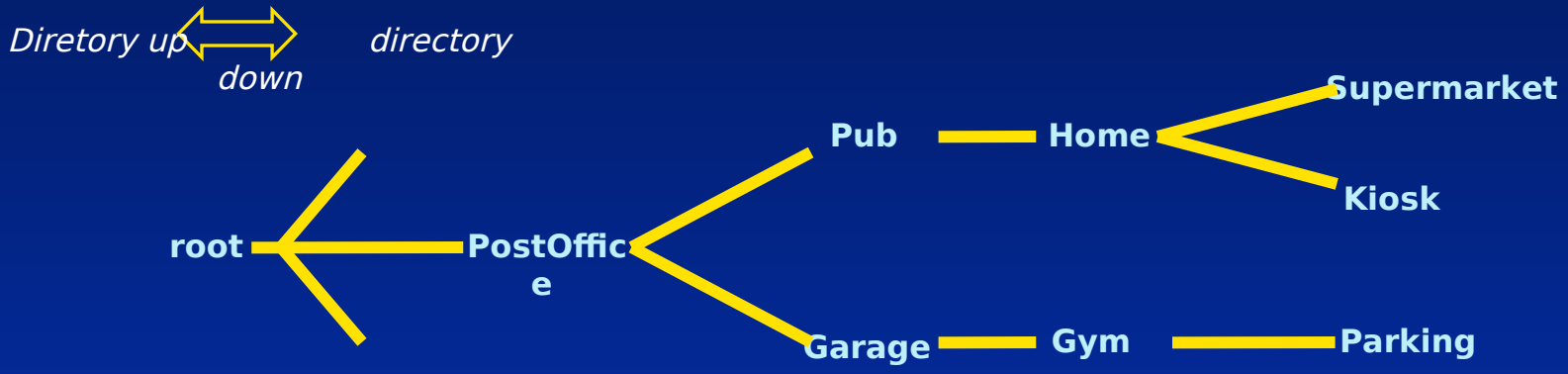
Absolute & Relative References



Way description for prevoius example ”Home to Gym” in a Linux filesy

ABSOLUT: ***/PostOffice/Garage/Gym***

RELATIVE: ***../../Garage/Gym***

Way description for prevoius example ”Home to Pub” in a Linux filesy

ABSOLUT: ***/Postoffice/Pub***

RELATIVE: ***..***

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Directories Commands

- **pwd** to display the present working directory
- **cd** to change directories

  cd .. *one directory up (higher directory) represented by 2 dots*

  cd / *brings you to the root directory*

  cd /etc

- **mkdir** to create a directory

  mkdir /tmp/chicago

  now cd into that directory to see that it exists

- **rmdir** to remove empty directories

  rmdir /tmp/chicago

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Files

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At the end of this Session, you will be able to:

- Define the criteria for defining a filename by linux standards.
- Explain what ‘*’ and ‘?’ represent.
- Use the following commands cp, mv, rm, cat more.
- Define what a link is.
- Create a link between files.
- Create a link between directories.

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File Names

- any upper- or lowercase letter, any number and the signs “+”, “-”, “_” and “.” can be used in a file name
- REMINDER -> As mentioned before: Linux is case sensitive!!
- the “.” and “_” can be used as often as desired, but the “.” should not be the first character of a file name
- also the minus sign “-” should not be the first character, otherwise the filename could be interpreted by the shell as a command option (switch)
- max length of a file name is 255 characters (chr), but keep in mind when creating files that many applications and other file systems can handle only shorter file names !!
- to be compatible with older Linux systems the max filename length is 14 chr, to be compatible with old MS DOS file systems the max length is 8 chr.

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Wildcards*

- “?” can represent any single character
- “*” can represent any character or any number of characters
  - Even blank spaces
  - When a * is used at the end of a string, it means any number of characters can follow, eg:
  - *> ls f** *will display all files that begin with f*
- **DO NOT use Wild cards in file names !!**

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File Manipulation

- **cp, mv, rm**

  > **cp** to copy files

  > **mv** to **move** or **rename** files

  > **rm** to remove/delete files

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File Manipulation

- **cp**

> *cd /tmp*

> *mkdir rockall*

> *cd rockall*

> *cp /etc/hosts myhosts1*

> *cp /etc/hosts .*

"." (dot) means current directory

> *cp hosts myhosts2*

> *ls*

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File Manipulation

- **mv**
  - > *mv myhosts2 renamed*
  - > *mv renamed /tmp*
- **rm**
  - > *rm myfile*
  - > *rm hosts myhosts1 /tmp/renamed*
  - > *cd /tmp*

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File Manipulation

- rm
  - There is no undelete feature for the rm command.
  - Once you rm a file, it is gone for[illegible].
  - DO NOT use with wildcards or recursive options

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Viewing Files

- **cat**
  - The **cat** command will list the contents of the file(s).

    > ***cat filename1***
    > ***cat filename2***
    > ***cat filename1 filename2***

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Viewing Files

- **more**
  - The **more** command also shows the contents of a file on the screen but one page at a time.

> ***more filename1***
>
> ***more filename2***
>
> ***more filename1 filename2***

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Viewing Files

- **more**

spacebar advance one page
<cr> advance one line
b to go one page back
/text search the file for '*text*'
? Get help when you are inside **more**
q to quit

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Exercises

- What is the difference between “cat” and “more”?
- How would you copy all the files with z in the filename to a subdirectory?
- What is a wild card, and when do we use it?
- Which command is used for renaming files? Is this command used for anything else?
- What options can you have with the “rm” command, and what do they do?

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Links

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Links

- Using links,we can access the same file from two or more places in the file system
- A single file can have several links with different names, and these links can be in different directories too.
- A link can be compared with a shortcut in MS-Windows

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Links

- ln -s creates a symbolic link in the current directory to
- a file elsewhere in the filesystem

> *cd /tmp*
>
> *ln -s /etc/fstab myfile*

- Now myfile can be edited from the /etc/fstab or the /tmp directories.

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Links

- **Entire directories can also be linked.**

```
> cd /tmp
> ln -s /home/dp?? newdir
> ls -l
```

  - **Now data in /home/dp?? is the same as the data in the /tmp/newdir directory.**

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Permissions

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At the end of this Session, you will be able to:

- Define the 3 types of people that can access a file.
- Define the 3 types of access that a user can have to a file.
- Explain the permissions of a current file.
- Explain how to change the permissions of a file.
- Explain how to change ownership of a file.

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Permissions

- **Each file or directory can be accessed by three types of people**
  - **user** who owns the file
  - **group** users assigned to a common group
  - **others** all other users on the system

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Permissions

- **Each type of user can be assigned any of three access rights:**
  - **read** allows contents to be read and the file to be copied
  - **write** allows the contents to be changed
  - **execute** allows files to be executed as a command

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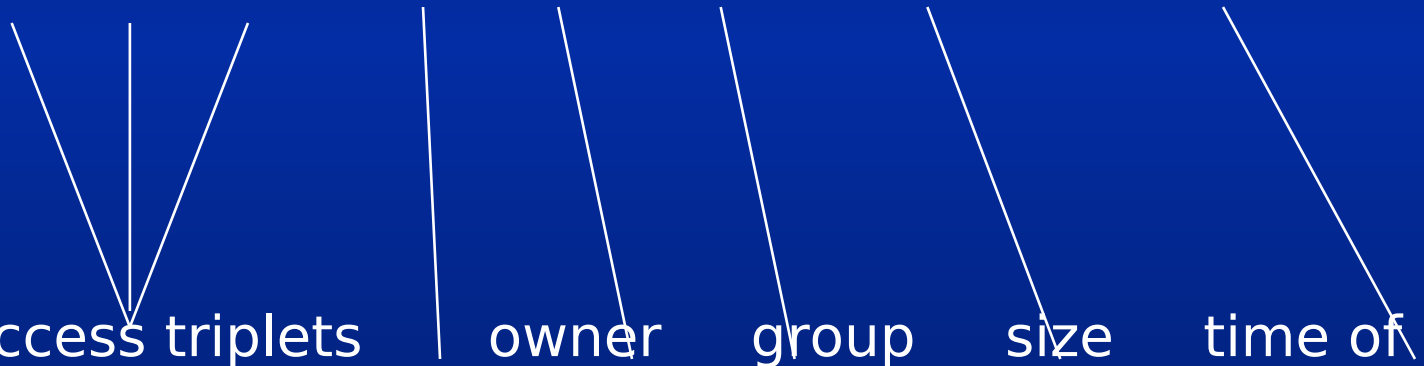
Permissions

- **a long printout option with the ls command:**

  > *ls -l myfile*

-rwx rwx rwx 1 root root 1230 sep 4 17:18 myfile



- access triplets owner group size time of creation file name
  - '-'The dash indicates that this is a file, a 'd' = directory and 'l' = link

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Permissions

- **The access triplets give us the current information on that file's permissions.**

rwx	**rwx**	**rwx**
user	group	others

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Changing Permissions

- **chmod**
  - Only the **owner** or the **super user** are allowed to change the permissions.
  - We can change the permissions of files and directories by two methods:
    - **Alphanumeric**
    - **Binary Notation**

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Changing Permissions

- **Alphanumeric**
  - **u** user, **g** group, **o** others, **a** all
  - **r** read, **w** write, **x** execute

> *chmod g+r filename* Add read permission to group

> *chmod ug-wx filename* Delete write and execute permission for user and group

> *chmod a+rx directory* Add read & excecute permissions to all

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Changing Permissions

- **Binary Notation**
  - Look at the access triplets as three separate binary numbers:

rwx **rwx** **rwx** **{** With permission on, the slot is **one**

user **group** **others** **{** otherwise it is **zero**

$2^2+2^1+2^0$ $2^2+2^1+2^0$ $2^2+2^1+2^0$

7 **7** **7**

> *chmod 700 filename* give all privileges to the owner, but take away all from group and others

> *chmod 604 filename*

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Changing Ownership

- **chown**

 # chown dp02 myfile (must be owner or superuser #)

> ls -l myfile

-rwx rwx rwx 1 dp02 dp01 1230 sep 4 17:18 myfile

new owner

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Exercises

- What are the two methods for changing permissions on a file?
- Give a brief description of both methods for changing file
- permissions.
- Why do we make linked files?
- Is it possible to link entire directories?
- Give a brief description for creating a link.

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FTP, VI , TELNET

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At the end of this Session, you will be able to:

- Define the term remote host
- Define the acroynm ‘ftp’.
- Explain what ftp does.
- Explain what the mget and mput commands do.
- Explain what the bin, hash and prompt commands do.
- List 3 different types of text editors available to you on the linux system
- List what are the 3 different modes of the vi editor

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Remote Hosts

- A remote host is machine/server onto which the user can login from the users current machine
- You can then run programs on that machine, transfer files there and manipulate files on the machine

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File Transfer Protocol

- **ftp transfers files to and from remote and local network sites**

  > ftp ot006

  Connected to hel.

  220 hel FTP server (Linux(r) System V Release 4.0) ready.

  Name (bil:dp01): **dp01**

  331 Password required for dp01.

  Password:

  230 User dp01 logged in.

  ftp> bin to set binary transfer

  ftp> hash so we can see the transfer take place

  ftp> prompt turn on or off the questions about file transfer

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File Transfer Protocol

- **Commands**

  ftp> mget filename get a file from the remote machine

  ftp> mput filename to send a file to the remote machine

  - **Note: ftp will get from the directory you are in on the remote machine and will put into the directory you were in before starting ftp unless you specify absolute paths.**

    ftp> cd directoryname change the remote directory

    ftp> lcd directoryname change the local directory

    ftp> ? list of ftp commands

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vi Editor

- **Linux has many different editors:**
  - ed, red, ex, edit, e, view, vedit, vipw, sed kedit
  - **vi**,
    - **These editors are found on all Linux machines.**

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vi Editor

- **Start the vi editor by typing**
  - **vi filename**
- **There are three different modes in the vi editor:**
  - **command mode** vi starts in this mode
  - **text mode** change to this mode to enter/edit text
  - **colonmode** for saving & exiting (type : to go to this mode)
- **<esc> to return to command mode and then one of the following to change to text mode**
  - **i will place your text in front of the cursor**
  - **a will place the text behind the cursor**
  - **x will delete a character**
  - **r will replace a character**

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vi Editor

- Lets create a new file and use vi
  - vi vifile
  - Add lines of text using the commands from the previous page
  - Move around the file
  - Delete some words
  - Delete whole lines

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Exercises

- What are the disadvantages with vi editor ?
- What are the advantages with vi editor ?
- How do you exit vi without saving the changes ?
- Why is it important for us to become familiar with the vi editor ?

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Telnet

- Allows a user to connect to another machine. And run applications and commands on that machine.
  - Telnet 134.32.140.253

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At the end of this Session, you will be able to:

- Find a file.
- Use the Grep command.
- Connect commands together.
- Compress a file.
- Use the Alias command.
- Find out the date.

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Finding a File

- **To search for files in the filesystem that match a given criteria**

  > ***find / -name ' filename'***

  > ***find / -name 'filename*'*** Wildcards can be used

  - I.e. **find** "where to search" "what" "then what"

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Searching Through a File

- **The grep command searches an input file for lines that match a specified pattern**
  - > ***grep name filename***
  - > ***grep No filename***
  - > ***grep –i No filename*** ignore case of text
  - I.e. **grep** "what" "where" Note that it is the opposite of find!

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Searching Through a File

> ***grep Hen.rix filename*** "." means any character

> ***grep -i ^Jimi filename*** "^" means that the pattern has to be at the beginning of the line

> ***grep Hendrix$ filename*** "$" means that the pattern has to be at the end of the line

> ***grep -i "Jimi Hendrix" filename*** Search for a pattern as defined between the ""; ignoring the case

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Connecting Outputs

- **Pipe |**
  - **To connect output from one program to input on another program.**

> ***ls /etc | more*** output of the the ls command is input to more

> ***ls -l | more***

> ***ls | wc –c*** wc command (outputs the number of newline characters) is performed on the output of ls

  - **All UNIX commands can be used with a pipe.**

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Compression Tools

- **Compressing**
  - > ***compress filename***
  - > ***gzip filename*** More compression so we use it but not so widely used outside the company
- **Uncompressing**
  - > ***uncompress filename.Z***
  - > ***gunzip filename.gz***

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Alias Tool

- **alias – lists all the defined ‘short-cuts’ for long commands**

  > alias

  data26 cd /server1/local11/course_data_26

- **Creating Aliases**
  - **edit the ~/.cshrc file** (take a backup first!)

    This file is the first to be read when the user logs in and contains all the permanent aliases
  - **For temporary aliases**

    > alias rm rm –I This alias will be active untill the next log in

    > unalias rm Has removed the alias from the rm command

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Miscellaneous Tools

> *date*
date.

Give the time and

> *cal*
on the screen.

Bring up a calander

> cal 2001

> cal 3 2001

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Exercises

- If you have a file with phonenumbers called tlf. How can you use grep to find a specific number ?
- What is *find* used for?
- Use date to get the time in GMT.

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